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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/080,933
Filing Date: February 22, 2002
Appellant(s): ZHANG ET AL.

Brad Y. Chin
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 6/21/10 appealing from the Office action mailed 2/16/10.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:

21, 23-28, 30-33, 36-38, 40-42, 46, and 47.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the

subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

6,775,322	ZANGI et al	8-2004
6,760,388	KETCHUM et al	7-2004

Taylor et al; US Patent Application Publication No. 2002/0197987, (Dec 26, 2002)

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 21, 23-26, 28, 30-33, 36, 38, 40-42 and 46-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zangi et al US Patent No. 6,775,322 et al. in view of Ketchum et al US Patent No. 6,760,388.

As per claim 21, Zangi et al teaches a receiving station (figs. 1 and 3) comprising a signal filter see col. 3, lines 47-50 inherently in communication with a signal receiving

antenna (note fig. 1 is described by Zangi as see col. 3, lines 29-30, as a mobile station therefore it has to include an antenna); a signal estimator 122 in communication with the signal filter see col. 4, lines 57-60; circuit (124) corresponding to the claimed (signal optimizer) configured to generate tap coefficients (optimized values) for the signal from the signal filter ; a prefilter 102 configured to filter the signal from the signal filter using the generated tap coefficients (optimized values) for the signal see col. 4, lines 59-61; circuits (104, 106 and 108) considered as the claimed "decision feedback sequence estimator" to receive the coefficients (optimized values) note input to filter 104, circuit blocks (104, 106 and 108) "decision feedback sequence estimator" comprising a summing element 106, a feedback filter 104 and a maximum likelihood sequence estimator 108, see col. 11, lines 9-12, as shown in fig. 3, Zangi teaches that the summing element 106, the feedback filter 104 and the MLSE 108 are operatively connected to one another and further connected to prefilter 102. Note that the interconnection of the prefilter 102r, the feedback filter 104, the MLSE 108 and the summing element 106 cooperatively operate to permit inherently concurrent interference and prefilter operation to be performed because there is no structural difference between the Zangi's disclosed features of prefilter, the feedback filter, the MLSE and the summing element and the applicant claimed features of "prefilter, the feedback filter, the MLSE and the summing element". However, Zangi et al does not explicitly teach that the apparatus is a MIMO system having a plurality of signal receivers where concurrent interference and prefilter operation can be performed for a plurality of signals received through said signal receivers. Ketchum et al teaches a

MIMO system Fig. 1 having a plurality of signal receivers 154a, 154r Note fig. 1 where concurrent interference and prefilter operation can be performed for a plurality of signals received through said signal receivers using MIMO processor 160 (Note fig. 3 and 5A, for instance). Given that fact, it would have been obvious to one skill in the art to incorporate such a teaching in Zangi in order to improve signal detection since the system would have been able to be configured to receive multiple copies so that existence of signal error can be easily determined. This is consistent with Ketchum et al that clearly teaches at col. 1, lines 26-28 that the likelihood of correctly receiving a data transmission increases as the number of antennas increases and the MIMO system would provide the increased in the number of antennas to facilitate such improvement. Alternatively, as acknowledge by Ketchum at col. 1, lines 38-40, MIMO system would have had the additional benefit of increasing transmission capacity.

As per claim 23, Zangi et al teaches that the output of the decision device (MLSE) 108 is configured to transmit generated maximum likelihood values through an output to the feedback filter 104 and the input of the decision device (MLSE) 108 is configured to receive summed values from the summing element 106.

As per claim 24, Zangi et al teaches the feedback filter 104 comprises a first input in communication with circuit 124 (signal optimizer) and configure to receive the optimized values from the circuit 124 (signal optimizer) and a second input configured to receive the generated maximum likelihood values from the MLSE 108.

As per claim 25, Zangi et al further teaches the summing element 106 receives inputs from prefilter 102 and the feedback filter 104 and sends a summed output to the MLSE device 108.

As per claim 26, the signal filter see col. 3, lines 47-50 is located in the forward path of the receiving station hence it has to be a feedforward filter.

As per claim 28, Zangi further teaches that the feedback filter 104 receives optimized signals from the signal optimizer 124 that are used to define filter characteristics of the feedback filter 104 see col. 4, lines 57-60.

As per claim 30, the signal filter see col. 3, lines 47-50 and the signal estimator 122 is placed in the received chain of the receiving station see fig. 1.

As per claim 31, Zangi et al does not teach the further limitations recited in claim 31. Ketchum et al teaches the further limitations of a plurality of receive chains corresponding to the plurality of signal receivers configured to receive and transmit a plurality of data vectors to the plurality of receive chains note fig. 1. Given that fact, it would have been obvious to one skill in the art to incorporate such a teaching in Zangi et al and the motivation to do so would have been the same as provided with respect to claim 21 above.

As per claim 32, see claim 31. In addition, Zangi teaches transmitting the coefficients (optimized feed forward filter parameters and the optimized feedback filter parameters) to a decision feedback sequence estimator (104, 106 and 108), wherein the decision feedback sequence estimator (104, 106 and 108) comprises a feedback filter 104: note that the limitation “simultaneously” is interpreted as “both”. Clearly Zangi

teaches that "both" interference cancellation and prefiltering operations are performed via the feedforward filter 102 and the feedback filter 104. See col. 4, lines 43-50. In addition, for the sake of argument, note that the prefiltered signal from feedforward filter 102 is provided as input to the summer 106 at the same time as the ISI compensated signal generated by feedback filter 104 (see col. 7, lines 15-21) another indication that the prefilter and ISI compensation are performed simultaneously.

As per claim 33, Zangi et al further teaches the feedforward filter 102 filters the data vector and transmitting a feedforward output to a summing element 106; receiving an output of the summing element in a MLSE device 108 and generating an output of that is transmitted to an input of the feedback filter 104 and subsequent component and filtering the output received from the MSLE device in the feedback filter 104 and transmitting a filtered signal to the summing element 106.

As per claim 36, Zangi further teaches the received chain comprises a receiving filter see col. 3, lines 47-50 inherently in communication with a signal receiving antenna (note fig. 1 is described by Zangi as see col. 3, lines 29-30, as a mobile station therefore it has to include an antenna); a channel estimator 122 in communication with the receiving filter; the channel estimator 122 in communication with circuit 124 corresponding to the claimed signal optimizer configured to optimized feedforward and feedback filter parameters see col. 5, lines 1-27.

As per claim 38 see rejection of claim 21 above in addition, Zangi et al teaches a receiving station (fig. 1 and 3) comprising receive filter (signal filter means) for filtering a signal from a receiver note col. 3, lines 47-50; a signal estimator means 122 for

estimating channel operations of the signal from the signal filtering means; means 124 corresponding to the claimed signal optimizing means in communication with the signal filtering means for generating coefficients (optimized values); prefiltering means 102 for filtering the signal from the signal filtering means using the generated coefficients (optimized values) means (104, 106 and 108) considered as the claimed "interference cancellation means" for receiving the coefficients (optimized values) to perform concurrent interference and prefilter operations; Zangi further teaches that means (104, 106 and 108) (interference canceling means) comprises summing means 106 for summing inputs from the prefiltering means 102; MLSE means 108 for generating maximum values from the summing means 106; and feedback filtering means 104 for filtering an output of the MLSE 104 based on the generated optimized values to generate feedback-filtered values. Note that the interconnection of the prefiltering means 102, the feedback filtering means 104, the MLSE means 108 and the summing means 106 cooperatively operate to permit inherently concurrent interference and prefilter operation to be performed because there is no structural difference between the Zangi's claimed features of prefiltering means, the feedback filtering means, the MLSE means and the summing means and the applicant claimed features of "prefiltering means , the feedback filtering means, the MLSE means and the summing means.

As per claim 40 see claim 23.

As per claim 41 see claim 24.

As per claim 42, Zangi et al further teaches the summing element 106 receives inputs from prefilter 102 and the feedback filter 104 and sends a summed output to the

MLSE device 108 and an output of the MLSE being an output from the receiving station see fig. 3.

As per claim 46, Zangi teaches that the apparatus is a mobile communication device. See col. 3, lines 29-30.

As per claim 47 the device is inherently an integrated circuit because mobile communication devices uses IC circuit.

Claims 27 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zangi et al US patent No. 6,775,322 in view of in view of Ketchum et al US Patent No. 6,760,388 and further in view of Taylor US Patent Application No. 2002/0197987.

As per claim 27, Zangi et al and Ketchum et al teach every feature of the claimed invention but do not explicitly teach the further limitation of a deinterleaver in communication with an output of the MLSE estimator and depuncture in communication with a deinterleaver and a channel decoder in communication with the deinterleaver. Taylor et al teaches a deinterleaver 58 in communication with an output of the MLSE estimator (i.e. output of demodulator/equalizer 56) and depuncture 62 in communication with a deinterleaver 58 and a channel decoder 64 in communication with the deinterleaver 58. It would have been obvious to one skill in the art to incorporate such a teaching in Zangi et al and Ketchum in order to recover the originally transmitted signal.

As per claim 37, see claim 27.

(10) Response to Argument

Applicant's arguments filed 6/21/10 have been fully considered but they are not persuasive.

Applicant argues that "Thus, equalizer 100, which Zangi explicitly discloses as a DFSE, includes a feedback filter 104, a summer 106, and a decision algorithm 108, i.e., all three structural elements are contained within the DFSE 100 (see Zangi, Figure 3). Zangi further explicitly discloses that DFSE 100 includes the pre-filter 102, the channel estimator 122, and the adaptive algorithm 124, i.e., the pre-filter 102, the channel estimator 122, and the adaptive algorithm 124 are also contained within the DFSE 100. Accordingly, one of ordinary skill in the relevant art would have understood that the DFSE 100 is not "configured to receive the generated optimized values" (emphasis added), rather, the optimized values are generated within the DFSE 100. DFSE 100 only receives the "received sequence, r(k)."

Examiner's rebuttal: Contrary to the applicant's position, Zangi et al does not explicitly recite that the **equalizer 100 is a DFSE**. It only teaches at col. 3, line 60-64 that such equalizer 100 **may be** a DFE **or** a **decision feedback sequence estimation (DFSE) equalizer** . And further at col. 4, lines 19-21, col. 8, lines 50-51 Zangi et al clearly teaches that the **equalizer 100 is a DFE**. Accordingly, examiner's interpretation of Zangi's summer 106, feedback filter 104 and the decision algorithm 108 (which is disclosed at col. 11, lines 9-12 as a maximum Likelihood Sequence Estimation algorithm) to correspond to the claimed "**decision feedback sequence estimator** (DFSE)" is consistent with the teaching of Zangi. Clearly, Fig. 3 of Zangi shows summer

106, feedback filter 104 and the decision algorithm 108 collectively the "**decision feedback sequence estimator** (DFSE)" configured to receive "coefficients "optimized values" from block 124.

In addition, the examiner respectfully submits that applicant is incorrect to state that equalizer 100 of Zangi et al is **simply a DFSE**. At col. 3, lines 60-64, Zangi et al clearly teaches that the equalizer 100 **may** be a **decision feedback sequence estimation (DFSE) equalizer**. In other words Zangi et al teaches that the equalizer 100 **may be** a **DFSE equalizer not just a DFSE**, as alleged by applicant. As such, interpreting Zangi's summer 106, feedback filter 104 and the decision algorithm 108 to correspond to applicant's claimed feature of a decision **feedback sequence estimator**, is consistent with the teaching of Zangi's et al. Again, Fig. 3 of Zangi clearly shows a summer 106, a feedback filter 104 and a decision algorithm 108, collectively, the "**decision feedback sequence estimator** (DFSE)" configured to receive "coefficients "optimized values" from block 124.

Furthermore, for the sake's of argument, assuming that applicant was correct (which the examiner is not admitting) in stating that equalizer 100 of Zangi et al is simply a DFSE , the claim limitations would have still been met by Zangi et al as set forth in the above rejection. Naming elements 106, 104 and 108 within Zangi et al fig. 3 a different name, by itself is not in any way a difference in structure if such elements (106, 104 and 108) are still connected the same way and produce the same result. Other than the dotted lines, the examiner does not see any structural difference between elements 106, 104 and 108 (see fig. 3 of Zangi et al), and elements 102, 92 and 94 collectively

refers to “DFSE” by applicant (note fig. 3 of the instant application). Applicant is reminded that in actual circuit implementation, dotted lines do not exist on the circuit board and therefore can not be considered as a structural difference between th eprior art and the claimed invention.

Applicant’s Comment: Applicant further argues that one of ordinary skill in the art would not have found it obvious to combine Zangi with Ketchum because of the fundamental differences between the feature for the system discussed in Ketchum and the features of the system discussed in Zangi et al.

Examiner’s response: A review of Zangi et al shows that a equalizer 100 (note Fig. 3) is disclosed and configured to reduce and minimize interference in a wireless communication environment note col. 3, line 65-col. 4, line 3. Ketchum also teaches a system having among other things a DFE configured to minimize interference, note fig. 3 equalizer 322, equalizer 510 shown in Fig. 5A, which are components of circuit 160, included in fig. 1, configure to minimize interference in a wireless communication system. In addition, at col. 23, lines 58-65, Ketchum teaches other type of Equalizer could be used. Hence, Tangi et al and Ketchum are in the same field of endeavor and are both applicable to signal detection/interference reduction using among other things equalization processing. Hence, one skill in the art would have found the teaching of Ketchum compatible with the teaching of Zangi and would have been motivated to combine them in the manner and reasons suggested above.

Applicant’s Comment: Applicant further argues that Ketchum fails to cure the deficiencies of Zangi. Ketchum makes no mention of a "decision feedback sequence

estimator configured to receive the generated optimized values, wherein the decision feedback sequence estimator comprises a summing element, a feedback filter, and a maximum likelihood sequence estimator," as recited in claim 21. Accordingly, Appellant respectfully submits that the Office Action failed to substantiate a prima facie case of obviousness to demonstrate that Zangi in view of Ketchum discloses every element recited in claim 21. Appellant respectfully requests reconsideration and withdrawal of the rejection of claim 21.

Examiner's response: Such point of argument is moot because Zangi is shown to disclose: decision feedback sequence estimator configured to receive the generated optimized values, wherein the decision feedback sequence estimator comprises a summing element, a feedback filter, and a maximum likelihood sequence estimator. Note the above rejection.

Applicant's Comment: With respect to the rejection of claim 23, applicant states that the additional limitations recited in the claim 23 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 23 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 24, applicant states that the additional limitations recited in the claim 24 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 24 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 25, applicant states that the additional limitations recited in the claim 25 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 25 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 26, applicant states that the additional limitations recited in the claim 26 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 26 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 28, applicant states that the additional limitations recited in the claim 28 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 28 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 30, applicant states that the additional limitations recited in the claim 30 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 30 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 31, applicant states that the additional limitations recited in the claim 31 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 31 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 46, applicant states that the additional limitations recited in the claim 46 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 46 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 47, applicant states that the additional limitations recited in the claim 47 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 47 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 32, applicant states that the additional limitations recited in the claim 32 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 32 are taught by Zangi et al in view of Ketchum.

Applicant's Comment: With respect to the rejection of claim 33, applicant states that the additional limitations recited in the claim 33 not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 33 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 36, applicant states that the additional limitations recited in the claim 36 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 36 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 40, applicant states that the additional limitations recited in the claim 40 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 40 are taught by Zangi et al in view of Ketchum.

Applicant's Comment: With respect to the rejection of claim 41, applicant states that the additional limitations recited in the claim 41 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 41 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 42, applicant states that the additional limitations recited in the claim 42 are not found in Zangi et al in view of Ketchum.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 42 are taught by Zangi et al.

Applicant's Comment: With respect to the rejection of claim 27, applicant states Taylor does not teach the DFSE and the MIMO system recited in claim 21 and further states that the additional limitations recited in the claim 27 are not found in Zangi et al in view of Ketchum in view of Taylor.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 27 and DFSE and the MIMO system are taught by Zangi et al in view of Ketchum and in view of Taylor

Applicant's Comment: With respect to the rejection of claim 37, applicant states the additional limitations recited in claim 37 are not taught Zangi in view of Ketchum and Taylor.

Examiner's response: Such comment is in error because as set forth in the above rejection, the additional limitations recited in claim 37 are taught by Zangi et al in view of Ketchum and in view of Taylor.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Jean B Corrielus/

Primary Examiner, Art Unit 2611

Conferees:

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